



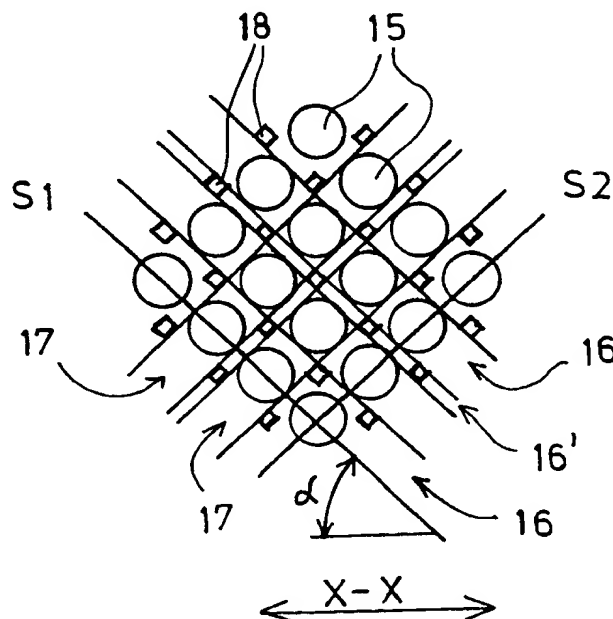
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : D21F 3/10		A1	(11) International Publication Number: WO 99/32713
			(43) International Publication Date: 1 July 1999 (01.07.99)
(21) International Application Number: PCT/FI98/00943 (22) International Filing Date: 3 December 1998 (03.12.98) (30) Priority Data: 974480 10 December 1997 (10.12.97) FI (71) Applicant (for all designated States except US): VALMET CORPORATION [FI/FI]; Panuntie 6, FIN-00620 Helsinki (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): NIKULAINEN, Osmo [FI/FI]; Emännäntie 1, FIN-40950 Muurame (FI). KARTTUNEN, Heikki [FI/FI]; Kauppakatu 19 B 12, FIN-40100 Jyväskylä (FI). LEINONEN, Antti [FI/FI]; Kielokummuntie 7 D 5, FIN-41340 Laukaa (FI). KIVIRANTA, Seppo [FI/FI]; Palokunnankatu 10 A 12, FIN-40700 Jyväskylä (FI). VILLGRÉN, Hannu [FI/FI]; Evakkotie 5, FIN-40200 Jyväskylä (FI). KETTUNEN, Miikka [FI/FI]; Rautpohjankatu 7 A 109, FIN-40700 Jyväskylä (FI). SALMINEN, Samppa, J. [FI/FI]; Roninmäentie 20, FIN-40500 Jyväskylä (FI). (74) Agent: FORSSÉN & SALOMAA OY; Yrjönkatu 30, FIN-00100 Helsinki (FI).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report. In English translation (filed in Finnish).	

(54) Title: ROLL FOR A PAPER OR BOARD MACHINE

(57) Abstract

The invention relates to a roll for a paper or board machine comprising axle journals on whose support the roll is arranged to revolve, end flanges with which the axle journals are connected, and a mantle which is connected with the end flanges. The mantle is provided with a number of openings extending through the mantle and/or recesses (15) formed into the outer surface of the mantle, which openings and/or recesses form a regular pattern. Solid connecting portions in the outer surface of the mantle around said openings and/or recesses (15) are opened so that, from each opening and/or recess (15), there is a connection, provided in the form of a groove or an additional recess (16, 17) extending into the outer surface of the roll mantle, with at least each of the openings and/or recesses (15) closest to it.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

410 Rec'd PCT/PTO 09 JUN 2000
1

Roll for a paper or board machine

5

The invention relates to a roll for a paper or board machine defined in the preamble of claim 1.

10 In paper or board machines, a web forming section employs mainly suction rolls which usually comprise a perforated roll mantle attached to end flanges at the ends of the roll. The end flanges are in turn journalled rotatably on attachment flanges situated at the ends of the roll and attached to the frame of the machine. Inside the roll mantle, there may be a static suction box attached to the attachment flanges enabling suction to be applied to a given sector of the suction roll. The interior of
15 the roll may also be empty, in which case suction is applied to the entire circumference of the roll mantle. The ends of the roll are provided with ducts by which an external source of negative pressure can be connected to the roll. Moreover, bores extending through the roll mantle are normally provided, in the outer surface of the mantle, with countersinks by means of which the unbroken connecting portions
20 surrounding the holes of the bores in the outer surface of the roll mantle are made smaller and the open area of the outer surface of the roll mantle is increased.

The press section of paper or board machines in turn employs rolls which have a roll mantle that is perforated or provided with blind-drilled bores. In that case, the
25 interior of the roll is not necessarily connected to a separate source of negative pressure. In a press nip, water is sucked into the holes, blind-drilled bores or other recesses of the roll mantle and removed from them after the press nip by means of the centrifugal force. In order to reduce the contact pressure, the mantle of press section rolls is normally coated with a material that is softer than steel, for example,
30 with some rubber-like material. The blind-drilled bores in a roll provided with a coated mantle may extend some distance into the steel mantle or merely into the coating depending on a desired volume of the bores. Moreover, both through bores

and blind-drilled bores are normally provided with countersinks in the outer surface of the mantle for reducing the size of the unbroken connecting portions that surround the holes or recesses in the outer surface of the roll mantle and for enlarging the open area of the outer surface of the roll mantle.

5

Around the perforations of the roll mantle on the outer surface of the roll mantle, despite holes, blind-drilled bores or recesses, there remain relatively large unbroken connecting portions at which the suction effect is weaker. For this reason, said unbroken outer surface of the roll mantle causes marking in the paper web.

10

One solution to this marking problem has been to provide the roll mantle, for example, with a coarse wire net, by which the open surface of the outer face of the roll mantle has been increased. The wire net or a wire sock is mostly made of plastic and it is attached in place by shrinking to form the outermost layer of the roll. The manufacture of such a wire sock and its fitting to the outer face of the roll mantle constitute an additional work stage in the manufacture of the roll. In addition, the wire sock wears in use and thus it has to be replaced at certain intervals.

15

It is also known to mount on the roll mantle a separate honeycomb arrangement made of metal by means of which the open surface of the outer face of the roll mantle is enlarged. It is difficult to fasten this kind of metal honeycomb to the face of the roll mantle and it may become detached in use.

20

DE patent 21 40 776 discloses a suction roll of a paper machine comprising a mantle stiffened against bending and a perforation extending through the mantle of the roll and forming a certain pattern. Additionally, the mantle surface of the roll is provided with grooves that connect a row of holes so that a symmetrical embossed pattern of the surface is formed in practice. The hole area in the surface of the roll mantle is over 50 % and it may be nearly 90 % of the total area of the roll mantle. It is also stated in the publication that some of the above-mentioned holes may be blind-drilled bores or that, in addition to the above-mentioned holes, blind-drilled bores are made into the surface of the mantle for improving the water retention capacity of the roll.

25

30

In this arrangement, the connecting surface of the walls between two adjacent grooves in the surface of the mantle forms a solid connecting portion supporting the wire or equivalent.

5 The problem in this arrangement of *DE patent 21 40 776* is the solid connecting portions at which the suction effect of the roll is weaker. These solid connecting portions constitute an obstruction to the free flow of water into the holes or blind-drilled bores.

10 The arrangement in accordance with the invention provides an essential improvement over the prior art arrangements.

The main characteristic features of the roll in accordance with the invention are set forth in the characterizing clause of claim 1.

15

The roll in accordance with the invention provides a very good and even flow of water into the holes extending through the mantle of the roll and/or into the blind-drilled bores and/or equivalent openings situated in the outer surface of the roll mantle. Moreover, in the roll in accordance with the invention, no separate wire
20 sock is needed on the outer surface of the roll mantle. The open area of the outer surface of the mantle of the roll in accordance with the invention is about 70-90 % depending on the application.

The arrangement of the invention may be used in a roll of a paper or board machine
25 which comprises either openings extending through the roll mantle, e.g. through bores, or recesses formed into the outer surface of the mantle, e.g. blind-drilled bores, or a combination of them. Such rolls are used, for example, in a web former and in a press section. The invention may be used in a suction roll where suction is applied to the circumference of the entire mantle or in a suction roll having a static
30 suction box by means of which suction is applied to a given sector of the roll. The arrangement in accordance with the invention may also be used in a roll which employs no external source of negative pressure, by which a negative pressure is

maintained in the interior of the roll. In that case, the water that is being removed from the web is transferred into the holes and/or blind-drilled bores of the roll mantle at the point of compression by the action of a pressure difference produced in the wire or equivalent supporting the web.

5

In the following, the invention will be described in more detail with reference to the figures in the accompanying drawings, to the details of which the invention is, however, not intended to be exclusively confined.

10 Figure 1 is a schematic sectional view of a suction roll.

Figure 2 shows one embodiment of a surface pattern in a mantle of a roll in accordance with the invention.

15 Figure 3 shows a variant of the embodiment of Fig. 2.

Figure 4 shows a second embodiment of a surface pattern in a mantle of a roll in accordance with the invention.

20 Figure 5 shows a third embodiment of a surface pattern in a mantle of a roll in accordance with the invention.

Fig. 1 is a view of principle of a suction roll where the arrangement in accordance with the invention may be used. The suction roll comprises a roll mantle 11, which is rotatably journaled on axle journals 13A and 13B connected to the roll mantle 11 through end flanges 12A and 12B. The roll mantle 11 has perforations 15 which are formed of numerous holes 15 extending through the roll mantle 11. The figure shows only some of the perforations 15 of the mantle 11. The interior of the roll is here empty, but inside the roll there may also be a suction box by means of which suction is guided to a given sector of the roll mantle. At least one 13B of the axle journals comprises ducts which lead to the interior of the roll and to which an external source of negative pressure (not shown in the figure) can be connected. Air

is sucked out (arrow P_2) by means of the source of negative pressure from the entire interior of the roll or at the sector formed by the suction box, in which connection a corresponding amount of air (arrow P_1) flows into the roll through the perforations 15 of the roll mantle. The perforations 15 of the roll mantle 11 may be composed of
5 bores extending with the same diameter through the entire mantle 11 or countersinks may have been made into the bores in the outer surface of the mantle 11, whereby the area of the holes 15 opening into the outer surface of the mantle 11 has been enlarged. The perforations 15 of the roll mantle 11 are advantageously formed to be spiral-shaped so that the holes are not situated in rows in the axial direction of the
10 roll. By this arrangement, the emptying of the holes 15 of water and the subsequent filling of the holes with air can be arranged to take place stepwise in terms of time, whereby the noise caused by this can be reduced. The diameter of the holes 15 is generally about 2—5 mm and the diameter of the countersinks is generally about 2—15 mm.

15

Fig. 2A shows one embodiment of a pattern in an outer surface of a mantle of a roll in accordance with the invention. The holes and/or blind-drilled bores or their countersinks 15 situated in the roll mantle form a regular pattern in the outer surface of the roll mantle. Through a line formed by the centres of the holes and/or blind-
20 drilled bores 15, it is possible to draw a curve which extends spirally along the outer surface of the roll mantle and whose angle of spiral relative to the axis X—X of the roll is α . In this figure, said angle α is about 45° , but in practical applications the angle of spiral α is, however, considerably smaller than 45° in order that the holes and/or blind-drilled bores 15 shall not be placed in rows parallel to the axis X—X of
25 the roll. In the example of Fig. 4, which shows another embodiment of the invention, the angle of spiral α is about 10° . The arrangement in accordance with the invention may in itself be used at any angle of spiral α and with any regular pattern formed by holes and/or blind-drilled bores.

30 The row formed by the holes and/or blind-drilled bores 15 in a first direction S1 in Fig. 2A is connected by means of a first groove 16 formed into the outer surface of the roll mantle and the row formed by these holes and/or blind-drilled bores 15 in

a second direction S2 is connected by means of a second groove 17 formed into the outer surface of the roll mantle. This figure depicts only two adjacent grooves 16 running in the first direction S1 and two adjacent grooves 17 running in the second direction S2. The width of the crossing grooves 16,17 in the outer surface of the roll mantle corresponds substantially to the diameter of the holes and/or blind-drilled bores or their countersinks 15 in the outer surface of mantle. When the first grooving 16 is made into the outer surface of the mantle on the holes and/or blind-drilled bores 15, a solid connecting portion 16' is formed between the adjacent grooves 16 in the outer surface of the mantle, which connecting portion prevents a free flow of water into the holes and/or blind-drilled bores 15. This solid connecting portion 16' is broken by means of the second grooving 17 situated crosswise with respect to the first grooving 16 and formed on the holes and/or blind-drilled bores 15. In that case, between four holes and/or blind-drilled bores or their countersinks 15 closest to one another, there remains a square-shaped support point 18 for a wire or an equivalent support member of the web running on the surface of the roll, which support point is situated on a level with the original outer surface of the mantle.

By means of the arrangement shown in Fig. 2A, the open area of the outer surface of the roll mantle can be enlarged at its maximum by about 90 % so that only the small square-shaped support points 18 support the wire running on the surface of the roll. From the edges of the square-shaped support points 18, the surface of the mantle inclines into the mantle and opens into the holes and/or blind-drilled bores 15 of the mantle, in which connection the water removed from the web is able to flow freely and evenly into the holes and/or openings of the mantle.

25

Fig. 2B shows a cross section of the roll mantle at the support points 18. The cross section shows a profile of the grooves 16,17 which is advantageously in the shape of a cone widening upwards to the outer surface of the mantle. The support points 18 are depicted here such that their outer surface constitutes a plane, which is the most preferable arrangement from the point of view of the manufacturing technique. In the arrangement that is the most preferable from the point of view of operation, the outer surface of the support points is hemispherical so that the edges of the square-

30

shaped support points will not form a sharp angulation for the wire. The hemispherical surface provides a smooth support surface for the wire moving on the surface of the roll. The depth of the grooves 16,17 is advantageously about 1.5—2 mm and they may be made into the outer surface of the roll mantle, for example, by turning, milling or knurling.

Fig. 3 shows a variant of the embodiment of Fig. 2. In Fig. 3, grooves 40,41 formed in first S1 and second S2 directions are provided between rows of holes and/or blind-drilled bores 15 such that the edges of the grooves 40,41 form a tangent to the holes and/or blind-drilled bores or their countersinks 15 in the outer surface of the mantle. In this arrangement, around each hole and/or blind-drilled bore or their countersink 15, there remain, in the outer surface of the mantle, four support points 42 for a wire or an equivalent member supporting the web. The open area of the outer surface of the mantle provided by this embodiment is not as large as that of the embodiment illustrated in Fig. 2, but in this case, too, water moves relatively efficiently and evenly into the holes and/or blind-drilled bores 15.

Fig. 4 shows a second embodiment of a pattern in an outer surface of a roll mantle in accordance with the invention. The holes and/or blind-drilled bores or their countersinks 15 situated in the roll mantle are shown in the figure as completely filled circles. In addition to the holes and/or blind-drilled bores or their countersinks 15, circular grooves 30 are formed into the outer surface of the roll mantle. The grooves 30 are made such that the centre of each groove 30 coincides with the centre of the holes and/or blind-drilled bores 15 and the centre radius of the grooves 30 is equal to the distance between the centres of the holes and/or blind-drilled bores 15. The centres of the holes and/or blind-drilled bores 15 are situated in this example at the apices of an equilateral triangle. The outer surface of the mantle surrounding the holes and/or blind-drilled bores or their countersinks 15 can be opened by means of said grooves 30. Connecting channels extending to the depth of the grooves 30 are thus formed between the holes and/or blind-drilled bores or their countersinks 15 in the outer surface of the mantle. In this embodiment, the wire or equivalent is supported by triangular support points 31. The open area of the outer surface of the

roll mantle can be regulated in this embodiment by regulating the width of the grooves 30. This embodiment, too, provides an efficient flow of water into the holes and/or blind-drilled bores 15.

5 Fig. 5 shows a third embodiment of a pattern in an outer surface of a mantle of a roll in accordance with the invention. In this embodiment, blind-drilled bores 50 are provided between holes and/or blind-drilled bores or their countersinks 15 such that each blind-drilled bore opens a connection to the closest holes and/or blind-drilled bores or their countersinks 15 surrounding it. By this means, the open area of the
10 roll mantle can be enlarged. The size of the open area of the outer surface of the mantle depends in this embodiment, among other things, on what kind of pattern the holes and/or blind-drilled bores 15 form in the outer surface of the mantle. If blind-drilled bores 50 are made to the hole pattern shown in Fig. 4, a relatively large open area can be achieved, and if blind-drilled bores 50 are made to the hole pattern
15 shown in Fig. 5, a slightly smaller open area is achieved. The support points supporting the wire are here denoted with the reference numeral 51.

The claims are presented in the following and the details of the invention may vary within the inventive idea of said claims and differ from the disclosure given above
20 by way of example only.

Claims

1. A roll for a paper or board machine comprising axle journals (13A,13B) supported by which the roll is arranged to revolve, end flanges (12A,12B) to which the
5 axle journals (13A,13B) are connected, a mantle (11) which is connected to the end flanges (12A,12B) and into which mantle (11) a number of openings extending through the mantle (11) and/or recesses (15) formed into the outer surface of the mantle have been made, which openings and/or recesses form a regular pattern, **characterized** in that solid connecting portions in the outer surface of the mantle
10 (11) around said openings, which are preferably holes, and/or around said recesses, which are preferably blind-drilled bores (15), are opened so that, from each opening and/or recess or from their countersink (15), there is a connection, provided in the form of a groove or an additional recess (16,17,40,41,30,50) extending into the outer surface of the roll mantle (11), with at least each of the openings and/or
15 recesses or their countersinks (15) closest to it.
2. A roll as claimed in claim 1, **characterized** in that a double grooving (16,17) is formed into the outer surface of the roll mantle (11) such that the first grooving (16) connects a row of holes and/or blind-drilled bores or their countersinks (15) in a first
20 direction (S1) and the second grooving (17) connects a row of holes and/or blind-drilled bores or their countersinks (15) in a second direction (S2) which crosses the first direction (S1), whereby separate support points (18) supporting the wire and situated between the holes and/or blind-drilled bores or their countersinks (15) are formed into the outer surface of the roll mantle (11).
- 25
3. A roll as claimed in claim 1, **characterized** in that a double grooving (40,41) is formed into the outer surface of the roll mantle (11) such that the first grooving (40) is made in a first direction (S1) between a row formed of holes and/or blind-drilled bores or their countersinks (15) and the second grooving (41) is made in a second
30 direction (S2) between a row formed of holes and/or blind-drilled bores or their countersinks (15), which second direction (S2) crosses the first direction (S1), whereby separate support points (42) supporting the wire and situated at the edges

of the holes and/or blind-drilled bores or their countersinks (15) are formed into the outer surface of the roll mantle (11).

4. A roll as claimed in claim 1, **characterized** in that circular grooves (30) are
5 formed into the outer surface of the roll mantle (11) around the holes and/or blind-
drilled bores or their countersinks (15).
5. A roll as claimed in claim 4, **characterized** in that the centres of the circular
grooves (30) coincide with the centres of the holes and/or blind-drilled bores (15)
10 and the centre radii of the circumference of the grooves (30) are equal to the
distance between the centres of the holes and/or blind-drilled bores (15) so that the
grooves (30) form channels that connect the holes and/or the blind-drilled bores (15).
6. A roll as claimed in claim 1, **characterized** in that additional blind-drilled bores
15 (50) are made into the outer surface of the roll mantle (11) between the holes and/or
blind-drilled bores or their countersinks (15) such that the additional blind-drilled
bores (50) have a connection to each of the holes and/or blind-drilled bores or their
countersinks (15) closest to it.

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 26 July 1999 (26.07.99)	
International application No. PCT/FI98/00943	Applicant's or agent's file reference HS/FI974480
International filing date (day/month/year) 03 December 1998 (03.12.98)	Priority date (day/month/year) 10 December 1997 (10.12.97)
Applicant NIKULAINEN, Osmo et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

11 June 1999 (11.06.99)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer A. Karkachi Telephone No.: (41-22) 338.83.38
--	--



RECORD COPY

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. **PCT/FI 98 / 0 0 9 4 3**

International Filing Date **0 3 DEC 1998 (0 3. 12. 98)**

The Finnish Patent Office
PCT International Application
 Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
 (if desired) (12 characters maximum) **HS/FI974480**

Box No. I TITLE OF INVENTION

Roll for a paper or board machine

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

VALMET CORPORATION
Panuntie 6
FIN-00620 HELSINKI
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:
Finland

State (that is, country) of residence:
Finland

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

NIKULAINEN Osmo
Emännäntie 1
FIN-40950 MUURAME
Finland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:
Finland

State (that is, country) of residence:
Finland

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Forssén & Salomaa Oy
Yrjönkatu 30
FIN-00100 Helsinki
Finland

Telephone No.

+358 9 615 3500

Facsimile No.

+358 9 615 35111

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.



1

2

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

KARTTUNEN Heikki
Kauppakatu 19 B 12
FIN-40100 JYVÄSKYLÄ
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

LEINONEN Antti
Kielokummuntie 7 D 5
FIN-41340 LAUKAA
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Finland

State (that is, country) of residence:

Finland

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

KIVIRANTA Seppo
Palokunnankatu 10 A 12
FIN-40700 JYVÄSKYLÄ
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

VILLGRÉN Hannu
Evakkotie 5
FIN-40200 JYVÄSKYLÄ
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on another continuation sheet.



4

e

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

KETTUNEN Miikka
Rautpohjankatu 7 A 109
FIN-40700 JYVÄSKYLÄ
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:
Finland

State (that is, country) of residence:
Finland

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SALMINEN Samppa J.
Roninmäentie 20
FIN-40500 JYVÄSKYLÄ
Finland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:
Finland

State (that is, country) of residence:
Finland

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.



.

.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria and Utility Model | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CZ Czech Republic and Utility Model | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DE Germany and Utility Model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DK Denmark and Utility Model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia and Utility Model | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland and Utility Model | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia and Utility Model |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> GW Guinea-Bissau | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ GD Grenada
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)



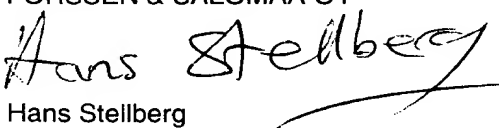
Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 10 Dec. 1997(10-12-97)	974480	Finland (FI)		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): **974480**

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY			
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):	
ISA / SE		Date (day/month/year)	Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING	
This international application contains the following number of sheets: request : 5 description (excluding sequence listing part) : 7 claims : 2 abstract : 1 drawings : 4 sequence listing part of description : Total number of sheets : 19	This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input checked="" type="checkbox"/> separate signed power of attorney 3. <input checked="" type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input checked="" type="checkbox"/> other (specify): Official Action
Figure of the drawings which should accompany the abstract: 2A	Language of filing of the international application: Finnish

Box No. IX SIGNATURE OF APPLICANT OR AGENT	
<i>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</i>	
FORSSÉN & SALOMAA OY  Hans Stellberg	

For receiving Office use only	
1. Date of actual receipt of the purported international application: <div style="text-align: right; font-size: 1.2em;">03 DEC 1998</div>	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA / SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.

For International Bureau use only	
Date of receipt of the record copy by the International Bureau:	<div style="font-size: 1.2em;">21 DECEMBER 1998</div> <div style="font-size: 1.2em;">(21. 12. 98)</div>



Telavaipan rei'ityksen ympärille telavaipan ulkopinnalle jää reikien, sokeaporausten tai syvennysten senkkauksista huolimatta suhteellisen suuret ehjät välikannakset, joiden kohdalla imuvaikutus on heikompi. Tästä johtuen kyseinen telavaipan ehjä ulkopinta aiheuttaa markkeerausta paperirainaan.

5

Eräs ratkaisu tähän markkeerausongelmaan on ollut varustaa telavaippa esim. karkealla viiraverkolla, jolla telavaipan ulkopinnan avointa pintaa on lisätty. Viiraverkko tai viirasukka on useimmiten muovia ja se kiinnitetään paikoilleen telan uloimmaiseksi kerrokseksi kutistamalla. Tällaisen viirasukan valmistaminen ja sen

10

sovittaminen telavaipan ulkopintaan muodostaa ylimääräisen työvaiheen telan valmistuksessa. Lisäksi viirasukka kuluu käytössä, joten se on määrävälein vaihdettava.

15

On myös tunnettua asentaa telan vaipan päälle erillinen metallista tehty kennosto, jolla telavaipan ulkopinnan avointa pintaa lisätään. Tällainen metallikennosto on hankala kiinnittää telavaipan pintaan ja se voi käytössä irrota.

20

DE-patenttijulkaisusta 21 40 776 tunnetaan paperikoneen imutela, jossa on taivutusta vastaan jäykistetty vaippa sekä telan vaipan läpi ulottuva määrättyyn kuvioon muodostettu rei'itys. Telan vaipan pintaan on lisäksi muodostettu uria, jotka yhdistävät rivin reikiä siten, että muodostuu käytännössä symmetrinen pinnan kohokuvio. Telan vaipan pinnassa oleva aukkopinta-ala on yli 50 % ja se voi olla lähes 90 % telan vaipan koko pinta-alasta. Julkaisussa on myös mainittu, että jotkut em. rei'istä voivat olla sokeaporauksia tai että em. reikien lisäksi on vaipan pintaan muodostettu

25

sokeaporauksia, joilla parannetaan telan veden pidätyskapasiteettia. Tällä järjestelyllä kahden vierekkäisen uran välisten seinämien vaipan pinnassa oleva yhdyspinta muodostaa yhtenäisen viiraa tai vastaavaa kannattavan välikannaksen.

30

Tässä *DE-patenttijulkaisun 21 40 776* ratkaisussa ongelmana on yhtenäiset välikannakset, joiden kohdalla telan imuvaikutus on heikompi. Nämä yhtenäiset välikannakset muodostavat esteen veden vapaalle virtaamiselle reikiin tai sokeaporauksiin.



Keksinnön mukaisella ratkaisulla aikaansaadaan olennainen parannus tekniikan tason ratkaisuihin nähden.

5 Keksinnön mukaisen telan pääasialliset tunnusmerkit on esitetty patenttivaatimuksen 1 tunnusmerkkiosassa.

10 Keksinnön mukaisella telalla saavutetaan erittäin hyvä ja tasainen veden virtaaminen telan vaipan läpi ulottuviin reikiin ja/tai telan vaipan ulkopinnassa oleviin sokeaporauksiin ja/tai vastaaviin aukkoihin. Keksinnön mukaisessa telassa ei myöskään tarvita erillistä viirasukkaa telavaipan ulkopinnassa. Keksinnön mukaisen telan vaipan ulkopinnan avoin pinta-ala on sovelluksesta riippuen noin 70—90 % .

15 Keksinnön mukaista ratkaisua voidaan käyttää paperi- tai kartonkikoneen telassa jossa on joko telan vaipan läpi ulottuvat aukot, esim. läpiporaukset tai vaipan ulkopintaan muodostetut syvennykset, esim. sokeaporaukset tai näiden yhdistelmä. Tällaisia teloja käytetään esim. rainan muodostusosalla ja puristusosalla. Keksintöä voidaan käyttää imutelassa, jossa imu kohdistetaan koko vaipan kehälle tai imutelassa, jossa on staattinen imulaatikko, jolla imu kohdistetaan telan määrättyyn sektoriin. Keksinnön mukaista ratkaisua voidaan myös käyttää telassa, jossa ei käytetä ulkoista alipaineläh-

20 dettä, jolla telan sisäosassa ylläpidetään alipainetta. Tällöin rainasta poistettava vesi siirtyy telan vaipan reikiin ja/tai sokeaporauksiin puristuskohdassa rainaa kannattavaan viiraan tai vastaavaan syntyvän paine-eron vaikutuksesta.

25 Seuraavassa keksintöä selostetaan yksityiskohtaisemmin oheisten piirustusten kuvioihin viitaten, joiden yksityiskohtiin keksintöä ei kuitenkaan ole tarkoitus yksinomaan rajoittaa.

Kuviossa 1 on esitetty kaaviollinen poikkileikkauskuva imutelasta.

30 Kuviossa 2 on esitetty eräs suoritusmuoto keksinnön mukaisen telan vaipan pintakuviosta.



Kuviossa 3 on esitetty eräs muunnos kuvion 2 suoritusmuodosta.

Kuviossa 4 on esitetty eräs toinen suoritusmuoto keksinnön mukaisen telan vaipan pintakuviosta.

5

Kuviossa 5 on esitetty eräs kolmas suoritusmuoto keksinnön mukaisen telan vaipan pintakuviosta.

Kuviossa 1 on esitetty periaatekuva imutelasta, jossa keksinnön mukaista ratkaisua
 10 voidaan käyttää. Imutela käsittää telavaipan 11, joka on laakeroitu pyörimään akselitapeilla 13A ja 13B, jotka liittyvät päätylaippojen 12A ja 12B kautta telavaipaan 11. Telavaipassa 11 on rei'itys 15, joka muodostuu lukuisista telavaipan 11 läpi ulottuvista rei'istä 15. Kuviossa on esitetty vain osa vaipan 11 rei'ityksestä 15. Telan sisäosa on tässä tyhjä, mutta telan sisällä voi myös olla imulaatikko, jolla imu
 15 ohjataan määrättyyn telavaipan sektoriin. Ainakin toisessa akselitapissa 13B on telan sisäosaan johtavat yhteen, johon ulkopuolinen alipainelähde (ei esitetty kuviossa) voidaan kytkeä. Alipainelähteellä imetään telan koko sisäosasta tai imulaatikon muodostaman sektorin kohdalta ilmaa ulos (nuoli P_2), jolloin vastaava määrä ilmaa nuoli (P_1) virtaa sisään telaan telavaipan rei'ityksen 15 kautta. Telavaipan 11 rei'itys
 20 15 voi muodostua koko vaipan 11 läpi samalla halkaisijalla ulottuvista porauksista tai porauksiin on voitu tehdä vaipan 11 ulkopintaan senkkaukset, jolloin reikien 15 vaipan 11 ulkopintaan avautuvaa pinta-alaa on suurennettu. Telavaipan 11 rei'itys 15 on edullisesti muodostettu spiraalimaiseksi siten, että reiät eivät sijaitse telan akselin suuntaisissa riveissä. Tällä järjestelyllä voidaan reikien 15 tyhjenemistä vedestä ja
 25 sitä seuraavaa reikien täyttymistä ilmalla porrastaa ajallisesti, jolloin tästä aiheutuvaa ääntä voidaan vähentää. Reikien 15 halkaisija on yleensä noin 2—5 mm ja senkkausten halkaisija on yleensä noin 2—15 mm.

Kuviossa 2A on esitetty eräs suoritusmuoto keksinnön mukaisen telan vaipan
 30 ulkopinnan kuviosta. Telavaipassa olevat reiät ja/tai sokeaporaukset tai niiden senkkaukset 15 muodostavat säännöllisen kuvion telan vaipan ulkopinnassa. Reikien ja/tai sokeaporausten 15 keskipisteiden muodostaman rivin kautta voidaan piirtää



spiraalimaisesti telan vaipan ulkopintaa myöten etenevä käyrä, jonka nousukulma telan akseliin X—X nähden on α . Tässä kuviossa kyseinen kulma α on noin 45° , mutta käytännön sovelluksissa nousukulma α on kuitenkin huomattavasti pienempi kuin 45° , jotta reiät ja/tai sokeaporaukset 15 eivät asetu telan akselin X—X suuntaisiin riveihin. Kuvion 4 esimerkissä, jossa on esitetty keksinnön eräs toinen suoritusmuoto nousukulma α on noin 10° . Keksinnön mukaista ratkaisua voidaan sinänsä käyttää millä tahansa nousukulmalla α ja millä tahansa reikien ja/tai sokeaporausten muodostamalla säännöllisellä kuviolla.

10 Kuviossa 2A olevien reikien ja/tai sokeaporausten 15 ensimmäiseen suuntaan S1 muodostama rivi on yhdistetty ensimmäisellä telan vaipan ulkopintaan muodostetulla uralla 16 ja näiden reikien ja/tai sokeaporausten 15 toiseen suuntaan S2 muodostama rivi on yhdistetty toisella telan vaipan ulkopintaan muodostetulla uralla 17. Tähän kuvioon on piirretty ainoastaan kaksi vierekkäistä ensimmäiseen suuntaan S1
15 kulkevaa uraa 16 ja kaksi vierekkäistä toiseen suuntaan S2 kulkevaa uraa 17. Ristikkäisten urien 16,17 leveys telan vaipan ulkopinnassa vastaa olennaisesti reikien ja/tai sokeaporausten tai niiden senkkausten 15 halkaisijaa vaipan ulkopinnassa. Kun vaipan ulkopintaan muodostetaan ensimmäinen uritus 16 reikien ja/tai sokeaporausten 15 päälle muodostuu vierekkäisten urien 16 väliin vaipan ulkopintaan yhtenäinen
20 välikannas 16', joka estää veden vapaata virtaamista reikiin ja/tai sokeaporauksiin 15. Tämä yhtenäinen välikannas 16' katkaistaan toisella ensimmäiseen uritukseen 16 nähden ristikkäisellä reikien ja/tai sokeaporausten 15 päälle muodostetulla toisella urituksella 17. Tällöin neljän lähinnä toisiaan olevan reiän ja/tai sokeaporauksen tai niiden senkkausten 15 väliin jää vaipan alkuperäisen ulkopinnan tasolla oleva
25 nelikulmion muotoinen viiran tai vastaavan telan pinnalla kulkevan rainan kannatuselimen kannatuspiste 18.

Kuvion 2A mukaisella järjestelyllä voidaan telan vaipan ulkopinnan avointa pinta-alaa maksimissaan suurentaa noin 90 % siten, että telan pinnalla kulkevaa viiraa kannattaa
30 vain pienet nelikulmion muotoiset kannatuspisteet 18. Nelikulmion muotoisten kannatuspisteiden 18 reunoista vaipan pinta viettää vaippaan sisään ja avautuu vaipan



reikiin ja/tai sokeaporauksiin 15, jolloin rainasta poistettava vesi pääsee vapaasti ja tasaisesti virtaamaan vaipan reikiin ja/tai aukkoihin.

Kuviossa 2B on esitetty poikkileikkaus telan vaipasta kannatuspisteiden 18 kohdalta. Poikkileikkauksesta näkyy urien 16,17 profiili, joka edullisesti on ylöspäin vaipan ulkopintaan levenevän kartion muotoinen. Kannatuspisteet 18 on tässä esitetty siten, että niiden ulkopinta muodostaa tason, joka on valmistusteknisesti edullisin ratkaisu. Toiminnan kannalta edullisimmassa ratkaisussa kannatuspisteiden ulkopinta on puolipallon muotoinen, jolloin nelikulmion muotoisten kannatuspisteiden reunat eivät muodosta terävää taitoskohtaa viiralle. Puolipallon muotoinen pinta muodostaa jouhevan tukipinnan telan pinnalla liikkuvalla viiralla. Urien 16,17 syvyys on edullisesti noin 1,5—2 mm ja ne voidaan muodostaa telan vaipan ulkopintaan esim. sorvaamalla, jyrsimällä tai pyältämällä.

Kuviossa 3 on esitetty eräs muunnos kuvion 2 suoritusmuodosta. Kuviossa 3 ensimmäiseen S1 ja toiseen S2 suuntaan muodostettavat urat 40,41 on muodostettu rei'istä ja/tai sokeaporauksista 15 muodostuvien rivien väliin siten, että urien 40, 41 reunat muodostavat vaipan ulkopinnassa tangentin rei'ille ja/tai sokeaporauksille tai niiden senkkauksille 15. Tässä järjestyksessä jokaisen reiän ja/tai sokeaporauksen tai niiden senkkausten 15 ympärille jää vaipan ulkopintaan neljä viiran tai vastaavan rainaa kannattavan elimen kannatuspistettä 42. Tässä suoritusmuodossa ei päästä yhtä suureen vaipan ulkopinnan avoimeen pinta-alaan kuin kuvion 2 mukaisessa suoritusmuodossa, mutta myös tässä tapauksessa vesi siirtyy suhteellisen tehokkaasti ja tasaisesti reikiin ja/tai sokeaporauksiin 15.

25

Kuviossa 4 on esitetty eräs toinen suoritusmuoto keksinnön mukaisen telan vaipan ulkopinnan kuviosta. Telavaipassa olevat reiät ja/tai sokeaporaukset tai niiden senkkaukset 15 näkyvät kuviossa kokonaan täytettyinä ympyröinä. Telavaipan ulkopintaan on reikien ja/tai sokeaporausten tai niiden senkkausten 15 lisäksi muodostettu ympyrän kehän muotoiset urat 30. Urat 30 on muodostettu siten, että kunkin uran 30 keskipiste yhtyy reikien ja/tai sokeaporausten 15 keskipisteeseen ja urien 30 keskisäde on yhtä suuri kuin reikien ja/tai sokeaporausten 15 keskipisteiden

30



välinen etäisyys. Reikien ja/tai sokeaporausten 15 keskipisteet sijaitsevat tässä esimerkissä tasasivuisen kolmion kärjissä. Tällaisilla urilla 30 voidaan reikiä ja/tai sokeaporauksia tai niiden senkkauksia 15 ympäröivää vaipan ulkopintaa avata. Reikien ja/tai sokeaporausten tai niiden senkkausten 15 välille muodostuu siten
 5 vaipan ulkopinnassa urien 30 syvyydelle ulottuvia yhteyskanavia. Tässä suoritusmuodossa viiraa tai vastaavaa kannattaa kolmiomaiset kannatuspisteet 31. Telan vaipan ulkopinnan avointa pinta-alaa voidaan tässä suoritusmuodossa säätää urien 30 leveyttä säätämällä. Myös tässä suoritusmuodossa saavutetaan veden tehokas virtaaminen reikiin ja/tai sokeaporauksiin 15.

10

Kuviossa 5 on esitetty eräs kolmas suoritusmuoto keksinnön mukaisen telan vaipan ulkopinnan kuviosta. Tässä suoritusmuodossa on reikien ja/tai sokeaporausten tai niiden senkkausten 15 väliin muodostettu sokeaporaukset 50 siten, että kukin sokeaporaus avaa yhteyden sitä lähinnä ympäröiviin reikiin ja/tai sokeaporauksiin tai
 15 niiden senkkauksiin 15. Tällä tavoin voidaan telan vaipan avointa pinta-alaa kasvat-
 taa. Vaipan ulkopinnan avoimen pinta-alan suuruus riippuu tässä suoritusmuodossa mm. siitä minkälaisen kuvion reiät ja/tai sokeaporaukset 15 muodostavat vaipan ulkopinnalla. Jos sokeaporaukset 50 tehdään kuviossa 4 esitettyyn reikäkuvioon, voidaan päästä suhteellisen suureen avoimeen pinta-alaan ja jos sokeaporaukset 50
 20 tehdään kuviossa 5 esitettyyn reikäkuvioon, päästään hieman pienempään avoimeen pinta-alaan. Viiraa kannattavat kannatuspisteet on tässä merkitty viitenumerolla 51.

25

Seuraavassa esitetään patenttivaatimukset, joiden keksinnöllisen ajatuksen piirissä keksinnön yksityiskohdat voivat vaihdella edellä vai esimerkinomaisesti esitetystä.



Patenttivaatimukset

1. Paperi- tai kartonkikoneen tela, joka käsittää akselitapit (13A,13B), joiden varassa tela on sovitettu pyörimään, päätylaipat (12A,12B), joihin akselitapit (13A,13B) liittyvät, vaipan (11), joka liittyy päätylaippoihin (12A,12B) ja johon vaippaan (11) on muodostettu useita vaipan (11) läpi ulottuvia aukkoja ja/tai vaipan ulkopintaan tehtyjä syvennyksiä (15), jotka muodostavat säännöllisen kuvion on, **tunnettu** siitä, että edellä mainittujen aukkojen, jotka edullisesti ovat reikiä ja/tai syvennysten, jotka edullisesti ovat sokeaporauksia (15) ympärillä olevat vaipan (11) ulkopinnan yhtenäiset välikannakset on avattu siten, että jokaisesta aukosta ja/tai syvennyksestä tai niiden senkkauksesta (15) on telan vaipan (11) ulkopinnan sisään ulottuvan uran tai lisäsyvennyksen (16,17,40,41,30,50) muodossa oleva yhteys ainakin jokaiseen sitä lähimpänä olevaan aukkoon ja/tai syvennykseen tai niiden senkkaukseen (15).
2. Patenttivaatimuksen 1 mukainen tela, **tunnettu** siitä, että telan vaipan (11) ulkopintaan on muodostettu kaksipäinen uritus (16,17) siten, että ensimmäinen uritus (16) yhdistää rivin reikiä ja/tai sokeaporauksia tai niiden senkkauksia (15) ensimmäiseen suuntaan (S1) ja toinen uritus (17) yhdistää rivin reikiä ja/tai sokeaporauksia tai niiden senkkauksia (15) toiseen suuntaan (S2), joka on risteävä ensimmäisen suunnan (S1) kanssa, jolloin telan vaipan (11) ulkopintaan muodostuu reikien ja/tai sokeaporausten tai niiden senkkausten (15) välissä olevat erilliset viiraa kannattavat kannatuspisteet (18).
3. Patenttivaatimuksen 1 mukainen tela, **tunnettu** siitä, että telan vaipan (11) ulkopintaan on muodostettu kaksipäinen uritus (40,41) siten, että ensimmäinen uritus (40) on muodostettu ensimmäiseen suuntaan (S1) rei'istä ja/tai sokeaporauksista tai niiden senkkauksista (15) muodostuvan rivin väliin ja toinen uritus (41) on muodostettu toiseen suuntaan (S2) rei'istä ja/tai sokeaporauksista tai niiden senkkauksista (15) muodostuvan rivin väliin, joka toinen suunta (S2) on risteävä ensimmäisen suunnan (S1) kanssa, jolloin telan vaipan (11) ulkopintaan muodostuu reikien ja/tai sokeaporausten tai niiden senkkausten (15) reunojen kohdalla olevia erillisiä viiraa kannattavia kannatuspisteitä (42).



4. Patenttivaatimuksen 1 mukainen tela, **tunnettu** siitä, että telan vaipan (11) ulkopintaan on reikien ja/tai sokeaporausten tai niiden senkkausten (15) ympärille muodostettu ympyrän kehän muotoisia uria (30).

- 5 5. Patenttivaatimuksen 4 mukainen tela, **tunnettu** siitä, että kehän muotoisten urien (30) keskipisteet yhtyvät reikien ja/tai sokeaporausten (15) keskipisteisiin ja urien (30) kehän keskisäteet ovat yhtä suuret kuin reikien ja/tai sokeaporausten (15) keskipisteiden välinen etäisyys, jolloin urista (30) muodostuu reikiä ja/tai sokeaporauksia (15) yhdistäviä kanavia.

10

6. Patenttivaatimuksen 1 mukainen tela, **tunnettu** siitä, että telan vaipan (11) ulkopintaan reikien ja/tai sokeaporausten tai niiden senkkausten (15) väliin on muodostettu lisäsokeaporauksia (50) siten, että lisäsokeaporauksista (50) muodostuu yhteys kuhunkin sitä lähinnä olevaan reikään ja/tai sokeaporaukseen tai niiden

15 senkkaukseen (15).



Tiivistelmä

Keksinnön kohteena on paperi- tai kartonkikoneen tela, joka käsittää akselitapit, joiden varassa tela on sovitettu pyörimään, päätylaipat, joihin akselitapit liittyvät, ja vaipan, joka liittyy päätylaippoihin. Vaippaan on muodostettu useita vaipan läpi ulottuvia aukkoja ja/tai vaipan ulkopintaan tehtyjä syvennyksiä (15), jotka muodostavat säännöllisen kuvion. Edellä mainittujen aukkojen ja/tai syvennysten (15) ympärillä olevat vaipan ulkopinnan yhtenäiset välikannakset on avattu siten, että jokaisesta aukosta ja/tai syvennyksestä (15) on telan vaipan ulkopinnan sisään ulottuvan uran tai lisäsyvennyksen (16,17) muodossa oleva yhteys ainakin jokaiseen sitä lähimpänä olevaan aukkoon ja/tai syvennykseen (15).

(Fig 2A)



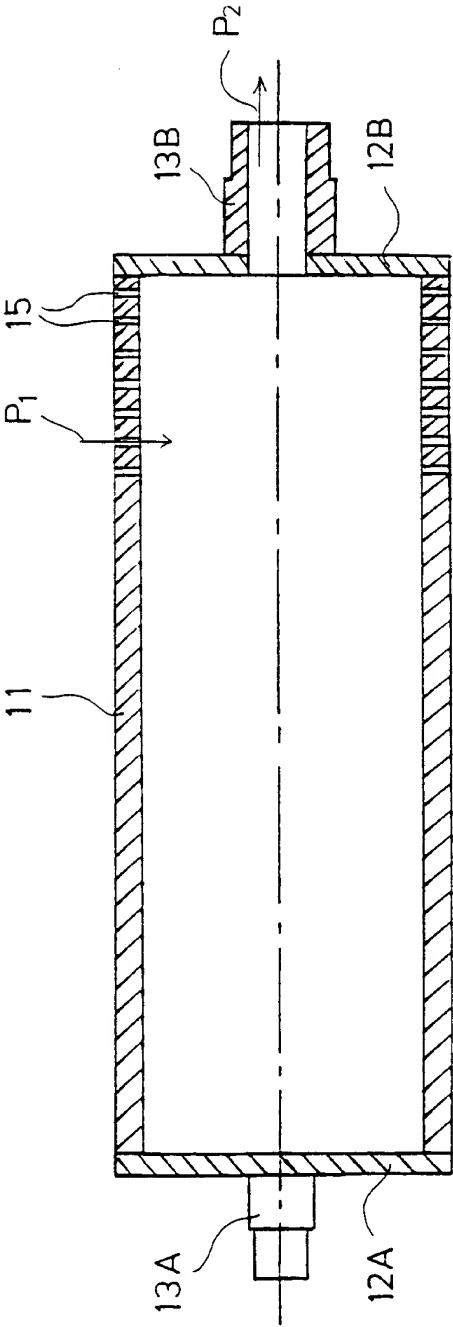


FIG. 1



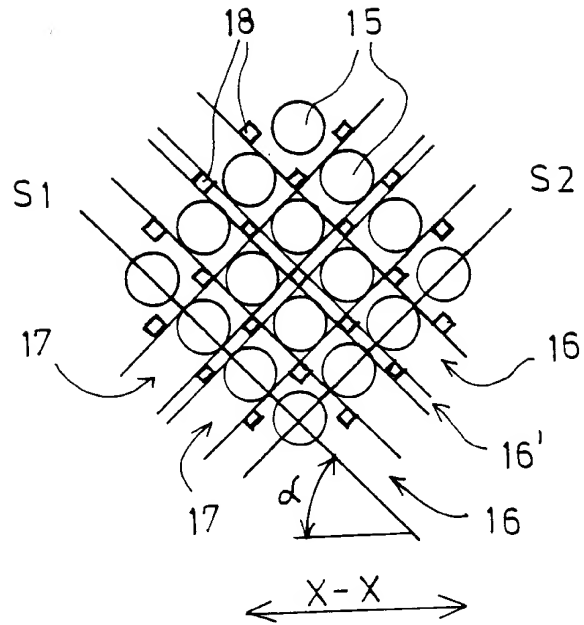


FIG. 2A

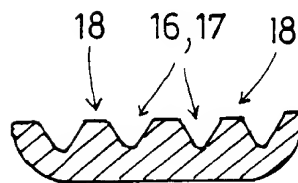


FIG. 2B



3/4

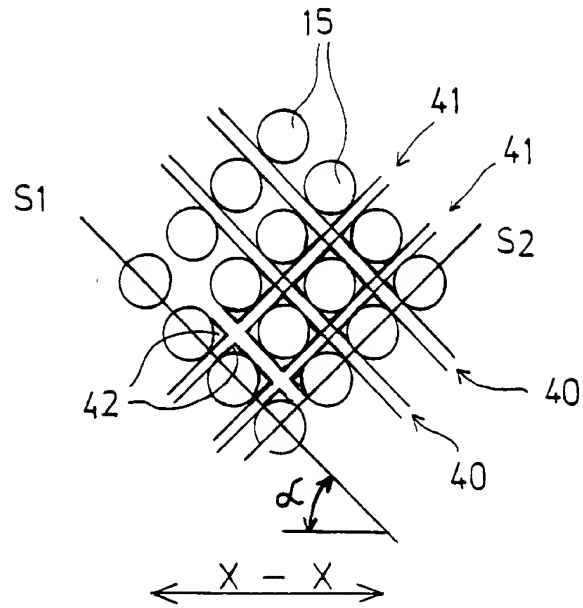


FIG. 3

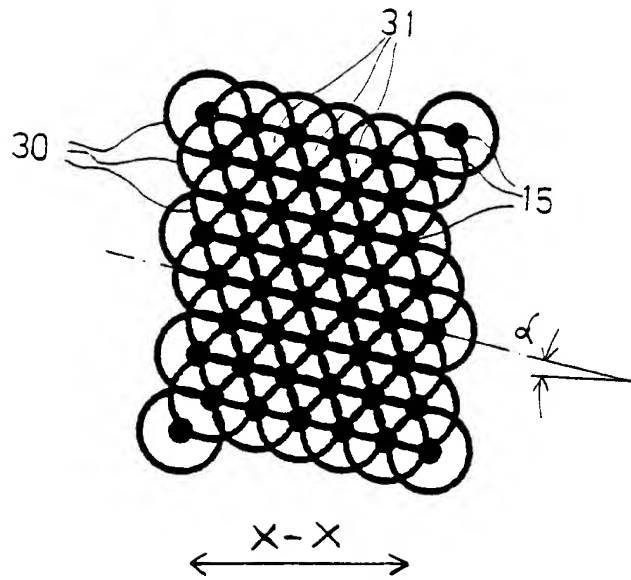


FIG. 4



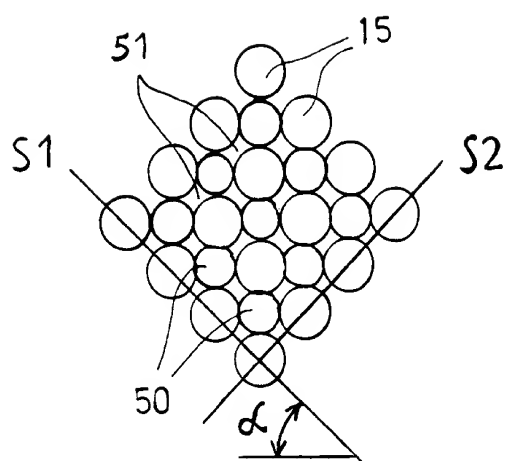


FIG. 5



Paperi- tai kartonkikoneen tela

5

Keksinnön kohteena on patenttivaatimuksen 1 johdanto-osassa määritelty paperi- tai kartonkikoneen tela.

Paperi- tai kartonkikoneissa käytetään rainanmuodostusosalla pääasiassa imuteloja, jotka käsittävät yleensä rei'itetyn telavaipan, joka on kiinnitetty päätylaippoihin telan päissä. Päätylaipat on puolestaan laakeroitu pyörivästi telan päissä oleviin koneen runkoon kiinnitettyihin kiinnityslaippoihin. Telavaipan sisällä voi olla kiinnityslaippoihin kiinnitetty staattinen imulaatikko, jolla imu voidaan kohdistaa imutelan määrättyyn sektoriin. Telan sisäosa voi myös olla tyhjä, jolloin imu kohdistuu telavaipan koko kehälle. Telan päädyissä on yhteet, joilla ulkoinen alipainelähde voidaan kytkeä telaan. Telavaipan läpi ulottuvat poraukset on lisäksi normaalisti varustettu vaipan ulkopinnassa senkkauksilla, joilla porausten reikiä ympäröiviä telavaipan ulkopinnan ehjiä välikannaksia pienennetään ja telavaipan ulkopinnan avointa pinta-alaa kasvatetaan.

20

Paperi- tai kartonkikoneiden puristusosalla käytetään puolestaan teloja, joissa on rei'itetty tai sokeaporauksilla varustettu telavaippa. Tällöin telan sisäosaa ei välttämättä ole kytketty erilliseen alipainelähteeseen. Puristusnipissä vesi imeytyy telan vaipan reikiin, sokeaporauksiin tai muihin syvennyksiin ja poistuu niistä puristusnipin jälkeen keskipakovoiman ansiosta. Puristusosan telojen vaippa on kosketuspaineen pienentämiseksi normaalisti päällystetty jollakin terästä pehmeämmällä aineella esim. jollain kumimaisella aineella. Päällystetyllä vaipalla varustetussa telassa sokeaporaukset voivat ulottua jonkin matkaa teräsvaippaan sisään tai pelkästään päällystykseen riippuen porausten halutusta tilavuudesta. Sekä läpimenevät poraukset että sokeaporaukset on lisäksi normaalisti varustettu vaipan ulkopinnassa senkkauksilla, joilla reikiä tai syvennyksiä ympäröiviä telavaipan ulkopinnan ehjiä välikannaksia pienennetään ja telavaipan ulkopinnan avointa pinta-alaa kasvatetaan.

30



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference HS/FI974480	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI98/00943	International filing date (day/month/year) 03.12.1998	Priority date (day/month/year) 10.12.1997
International Patent Classification (IPC) or national classification and IPC ⁷ D 21 F 3/10		
Applicant Valmet Corporation et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11.06.1999	Date of completion of this report 21.03.2000
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Tomas Lund/ELY Telephone No. 08-782 25 00



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI98/00943

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☒ the international application as originally filed.

☐ the description, pages _____, as originally filed,
 pages _____, filed with the demand,
 pages _____, filed with the letter of _____,
 pages _____, filed with the letter of _____.

☐ the claims, Nos. _____, as originally filed,
 Nos. _____, as amended under Article 19,
 Nos. _____, filed with the demand,
 Nos. _____, filed with the letter of _____,
 Nos. _____, filed with the letter of _____.

☐ the drawings, sheets/fig _____, as originally filed,
 sheets/fig _____, filed with the demand
 sheets/fig _____, filed with the letter of _____,
 sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI98/00943

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-6</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-6</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-6</u>	YES
	Claims		NO

2. Citations and explanations

The claimed invention relates to a rotating roll for a paper or board machine. The roll is arranged with a mantle connected to end flanges. The mantle is arranged with a number of holes for suction and recesses formed into the outer surface forming a regular pattern.

The object of the claimed invention is to eliminate large unbroken connecting portions on the outer surface of the roll. At this portion the suction effect is weaker and this causes markings in the paper web. To avoid this, unbroken connecting portions on the outer surface between holes and recesses are arranged with a groove, or an additional recess, in fluid communication with the holes or the recesses.

DE, 32 10 320 A1, cited in the International Search Report, discloses a suction roll for a paper machine provided with a separate honeycomb structure mounted on the outer surface of the roll mantle. The roll of the claimed invention differs from this known roll in that there are no separate structure on the mantle of the roll. The mantle of the claimed roll is provided with a particular kind of surface pattern and this pattern is made by machining, e g grooves, directly on the surface of the mantle. Further it has to be considered that the claimed invention involves an inventive step with respect to DE, 32 10 320 A1, which is revaluated to be a background art document.

Hence, the claimed invention is novel, it is not regarded obvious to a person skilled in the art and there will be no doubts about its usefulness. Therefore, the stipulated criteria regarding novelty, inventive step and industrial applicability under PCT Article 33 (1) are fulfilled for the claimed invention.



PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 26 July 1999 (26.07.99)	Applicant's or agent's file reference HS/FI974480
International application No. PCT/FI98/00943	
International filing date (day/month/year) 03 December 1998 (03.12.98)	Priority date (day/month/year) 10 December 1997 (10.12.97)
Applicant NIKULAINEN, Osmo et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

11 June 1999 (11.06.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer A. Karkachi Telephone No.: (41-22) 338.83.38
--	--

